

SAMBALPUR UNIVERSITY

JYOTI-VIHAR, BURLA



FACULTY OF SCIENCE

SYLLABUS
M.Sc.(BOTANY)
(CBCS Pattern)



[Syllabus with effect from 2022-23 onwards]

MSc. Botany 2nd Sem.
Syllabus

M.Sc. BOTANY

(Effective from the Session 2022-2024)

OUTLINE OF THE COURSE

SL NO	PAPER	COURSE TITLE	CREDITS (CH)	MARKS		
				End term	Midterm	Total
SEMESTER I						
1	BOT -101	Microbial Diversity	4	80	20	100
2	BOT -102	Diversity of Cryptogams and Gymnosperm	4	80	20	100
3	BOT -103	Cell and Molecular Biology	4	80	20	100
4	BOT -104	Analytical Techniques	4	80	20	100
5	BOT -105	Practical	4	100		100
		Total credit hours/marks for First semester	20	420	80	500
SEMESTER II						
1	BOT -201	Systematics of Angiosperm	4	80	20	100
2	BOT -202	Plant Physiology and Metabolism	4	80	20	100
3	BOT -203	Biochemistry	4	80	20	100
4	BOT -204	Ecology and Biostatistics	4	80	20	100
5	BOT -205	Practical	4	100		100
		Total credit hours/marks for Second semester	20	420	80	500
SEMESTER III						
1	BOT -301	Plant Embryology and Anatomy	4	80	20	100
2	BOT -302	Genetics, Plant Breeding and Evolution	4	80	20	100
3	BOT -303	A-Phytomedicine B- Molecular Plant Pathology	4	80	20	100
4	BOT -304	A- Natural Resource, Conservation and Utilization B- Environmental Biotechnology and Waste Management	4	80	20	100
5	BOT -305	Practical	4	100		100
		Total credit hours/marks for Third semester	20	420	80	500
SEMESTER IV						
1	BOT -401	Advance Plant Biotechnology	4	80	20	100
2	BOT -402	Project, Seminar Presentation, Field Study, Scientific visit	4	80	20	100
		Elective Paper (Students have to Choose anyone)				
3	BOT -403E-A	Biosystematics	4	80	20	100
4	BOT -403E-B	Molecular Stress Biology	4	80	20	100
5	BOT -404	A- Environmental Laws B- Environmental Science and Biotoxicology	4	50+30	20 (Interim)	100
6	BOT -405	Practical	4	100		100
		Total credit hours/marks for Fourth semester	20	420	80	500
		Grand Total	80	1680	320	2000
1	BOT -IDC-406	Economic Botany	3			

[B: In all the practical examinations 10 marks will be meant for seminar presentation and seminar report preparation.]

SEMESTER II

PAPER: BOT 201

SYSTEMATICS OF ANGIOSPERM

100 marks (80+20)

4 CH

Unit I: Taxonomic Structure:

Taxonomic hierarchy; Concept of species, genus and family, Plant Nomenclature: Salient features of International Code of Nomenclature (ICN) for Algae, Fungi and Plants: priority, effective and valid publications and author citation. Type concept, Taxonomic Tools: Field and Herbarium techniques; Floras and Botanic Gardens, Computer and Taxonomy.

Unit II: Systems of Angiosperm classification

Major contributions of Theophrastus, Bauhin, Tournefort, Linnaeus, Adanson, de Candolle, Bessey, Hutchinson, Takhtajan and Cronquist; Classification systems of Bentham and Hooker (upto series) and Engler and Prantl (upto series), Hutchinson; Brief reference of Angiosperm Phylogeny Group (APG III) classification.

Unit III Range of floral structures and comparative study of important orders.

Dicots: Ranales, Urticales, Umbelliferae, Rosales, Asterales. Monocots: Glumiflorae, Scitamineae, Microspermae. Brief account of flora of Odisha.

Unit IV: Numerical taxonomy and Taxonomic evidences

Angiospermic cladistic, Variations, OTUs, Phenograms, Cladograms, Terms and concepts (Primitive and advanced, Homology and Analogy, Parallelism and convergence, monophyly, paraphyly, polyphyly and cladodes). Evidences: Anatomy, Palynology, Cytology, Phytochemistry, Evolution of Angiosperm (Phylogenetic tree).

SUGGESTED READINGS:

1. Principles of Angiosperms Taxonomy by Davis, P. H. and Heywood, V. H., Robert E. Kreiger, New York.
2. Current Concepts in Plant Taxonomy by Heywood, V. H. and Moore, D. M., Academic press, London.
3. Principles and Methods Plant Biosystematics by Solbrig, O. T., MacMillan, London.
4. Plant taxonomy and Biosystematics by Stace, C. A., Edward Arnold, London.
5. Diversity and Classification of Flowering Plants by Takhtajan, A. L. Columbia University Press, NY.
6. Contemporary Plant Systematics by Woodland, D. W. Prentice-Hall, New Jersey, USA


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PLANT PHYSIOLOGY AND METABOLISM

100 marks(80+20)

4CH

Unit-I:**Water relation:** Properties of water, Types of solutions, Water potential**Photosynthesis:** Light harvesting complexes; mechanisms of electron transport; photoprotective mechanisms, C₃ fixation C₃, C₄ and CAM pathways. Respiration and photorespiration - Citric acid cycle; plant mitochondrial electron transport and ATP synthesis; alternate oxidase; photorespiratory pathway.**Unit- II:****Nitrogen metabolism** - Nitrate and ammonium assimilation; amino acid biosynthesis.**Plant hormones** - Biosynthesis, storage, breakdown and transport; physiological effects and mechanisms of action.**ATP Synthesis.** Mechanism of ATP synthesis, substrate level phosphorylation and oxidative phosphorylation, Chemiosmotic Mechanism (ETC), ATP synthesis, Boyers conformational change model, role of uncouplers.**Unit-III:****Sensory photobiology** - Structure, function and mechanisms of action of phytochromes, cryptochromes and phototropins; stomatal movement; photoperiodism and biological clocks.

- uptake, transport and translocation of water, ions, solutes and macromolecules from soil, through cells, across membranes, through xylem and phloem; transpiration; mechanisms of loading and unloading of photoassimilates.

Unit- IV:**Phytohormones-** Discovery, chemical nature, transport and physiological role of Auxin, Gibberellins, Cytokinins, ABA, Ethylene, Brassinosteroids, Jasmonic Acids.**Secondary metabolites** - Biosynthesis of terpenes, phenols and nitrogenous compounds and their roles. Stress physiology - Responses of plants to biotic (pathogen and insects) and abiotic (water, temperature and salt) stresses.**SUGGESTED READINGS:**

1. Plant Physiology by Taiz and Zieger
2. Plant Physiology by Frank B. Salisbury, Cleon W. Ross


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**PAPER: BOT203
BIOCHEMISTRY**

100 marks (80+20)

4 CH

Unit-I:

Structure of atoms, molecules and chemical bonds. Composition, structure and function of biomolecules (carbohydrates, lipids, proteins, nucleic acids and vitamins).

Unit- II:

Conformation of nucleic acids (helix (A, B, Z), t-RNA, micro-RNA). Stability of proteins and nucleic acids. Metabolism of carbohydrates, lipids, amino acids nucleotides and vitamins.

Unit-III:

Bioenergetics, glycolysis, oxidative phosphorylation, coupled reaction, group transfer, biological energy transducers. Principles of catalysis, enzymes and enzyme kinetics, enzyme regulation, mechanism of enzyme catalysis, isozymes, Conformation of proteins (Ramachandran plot, secondary structure, domains, motif and folds).

Unit- IV:

Stabilizing interactions (Vander Waals, electrostatic, hydrogen bonding, hydrophobic interaction, etc.). Principles of biophysical chemistry (pH, buffer, reaction kinetics, thermodynamics, colligative properties).

SUGGESTED READINGS:

1. Lehninger Principles of Biochemistry
2. Harper's Illustrated Biochemistry
3. Biochemistry by U.Satyanarayan


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ECOLOGY AND BIOSTATISTICS

100 marks(80+20)

4 CH

Unit-I:

The Environment: Physical environment; biotic environment; biotic and abiotic interactions. Habitat and Niche: Concept of habitat and niche; niche width and overlap; fundamental and realized niche; resource partitioning; character displacement.
Population Ecology: Characteristics of a population; population growth curves; population regulation; life history strategies (r and K selection); concept of metapopulation – demes and dispersal, interdemie extinctions, age structured populations.

Unit- II:

Species Interactions: Types of interactions, interspecific competition, herbivory, carnivory, pollination, symbiosis. Community Ecology: Nature of communities; community structure and attributes; levels of species diversity and its measurement; edges and ecotones. Ecological Succession: Types; mechanisms; changes involved in succession; concept of climax.
Ecosystem Ecology: Ecosystem structure; ecosystem function; energy flow and mineral cycling (Carbon, N, P); primary production and decomposition; structure and function of some Indian ecosystems: terrestrial (forest, grassland) and aquatic (fresh water, marine, estuarine).

Unit-III:

Biogeography: Major terrestrial biomes; theory of island biogeography; biogeographical zones of India.
Applied Ecology: Environmental pollution; global environmental change; biodiversity: status, monitoring and documentation; major drivers of biodiversity change; biodiversity management approaches. Conservation Biology: Principles of conservation, major approaches to management, Indian case studies on conservation/management strategy (Project Tiger, Biosphere reserves).

Unit- IV:

Biostatistics: Statistics, data, population, samples, variables, parameters, Representation of Data: Tabular, Graphical; Measures of frequency and central tendency: Arithmetic mean, mode, median, Measures of dispersion: Range, mean deviation, variance, standard deviation; Chi-square test for goodness of fit. Test of significance: comparison of large, small and paired samples (t-Test) and Correlation.

SUGGESTED READINGS:

- 1 Fundamentals of Ecology E.P. Odum
- 2 Ecology by M.C. Dash
- 3 Ecology by Sadabha
- 4 Biostatistics by Mishra and Mishra


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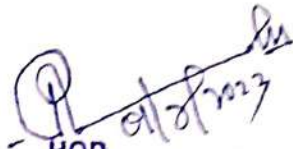
PAPER: BOT205

PRACTICAL

100marks

4CH

1. Description and Identification of Angiosperms family, genus and species level flora.
2. Herbarium techniques.
3. Microscopic study of ovules.
4. Determination of rate of photosynthesis
5. Preparation of Buffers.
6. Quantitative estimation of protein (Lowry methods/Bradford Method), Sugar (Anthrone Method), Lipids (Bligh and Dyer Method).
7. Quantitative estimation of Amino acids (Ninhydrin methods)
8. Estimation of Pigments (Chlorophylls and carotenoids) from plant and algal materials.
9. Isolation of plant DNA and quantification of extracted DNA by spectrophotometric methods.
10. Soil Nitrogen estimation.
11. Soil Carbon estimation.
12. Measurement of Central tendency
13. Measurement of Dispersion
14. Student t-Test
15. Chi-Square Test


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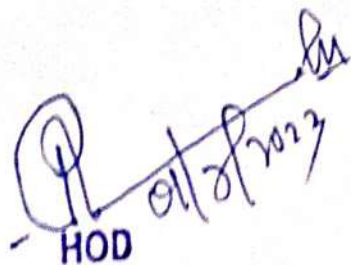
PAPER: BOT205

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100marks

4CH

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